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The Effects of Early Castration on Slaughter and Carcass Characteristics of Norduz Male Kids

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Abstract: This study examined the effects of early castration on slaughter and carcass characteristics of Norduz goat male kids. Animal material consisted of 25 male kids divided into two groups-an early castrated group (n = 13) and a control group (n = 12). All animals were weaned at 3 months and then subjected to an 85 days fattening period. Kids were fed with a ration of concentrate (16.6% crude protein and 10.6 MJ kg^{-1} DM ME) *ad libitum* +200 g sainfoin per kid twice daily. At the end of the fattening period, eight kids from each group were slaughtered to determine carcass characteristics. Significant differences ($p<0.01$) were found in the slaughter weights of castrated (24.84±0.465 kg) and intact (30.41±1.061 kg) kids. Cold carcass weights of castrated (9.40±0.230 kg) and intact (11.53±0.544 kg) kids also varied significantly ($p<0.05$). Muscle, bone, subcutaneous fat and intermuscular fat percentages in the chop region for intact and castrated groups were, respectively, 43.15±0.822 and 41.48±0.579%; 24.60±1.026 and 26.84±0.750%; 7.66±0.711 and 10.21±0.615%; 7.48±0.506 and 7.25±0.693%. It was concluded that early castration had no significant on the carcass characteristics of Norduz male kids.

Key words: Dressing percentage, chop, subcutaneous fat, carcass jointing, leg, omental fat

INTRODUCTION

When compared to other ruminants, goats are better able to tolerate unfavourable management and maintenance conditions, making the raising of goats preferable and more widespread in many developing regions, especially in the Mediterranean. Overall, >95% of the goat population is found in developing and underdeveloped countries, compared to <5% in developed countries (Daskiran *et al*., 2006).

In Turkey, goat meat accounts for only 6.8% of total red meat consumption. In comparison to sheep and cattle meat, goat meat is lower in fat and cholesterol content. While high protein and low fat content makes goat meat an important source of human nutrition, its low fat content is a disadvantage in terms of juiciness, flavour and tenderness.

Meat quality is influenced by various factors that include genotype, sex, age and feeding conditions (Johnson and McGowanb, 1998; Boyazoglu and Morand-Fehr, 2001). Castration of male kids is performed to improve growth rates, feed efficiency and meat quality as well as to reduce unwanted odours released by hormonal circuits. Castrated kids have been shown to have lower percentages of muscle tissue and higher percentages of fat tissue than intact kids (Morand-Fehr *et al*., 1991). Louca *et al*. (1977) and Kor have shown that flavour and tenderness of castrated kid meat can be improved by increasing the amount of intermuscular fat content. However, Kor and Coban reported that the impact of castration on fattening is not significant.

It is possible that the age of castration may have an effect on meat quality and growing rates. However in comparison to other species, few studies have been conducted on goatsand the effects of castration at different ages have not been fully elucidated. To the best of our knowledge, no study related to castration has been conducted with Norduz goat male kids. Therefore, this study aimed to determine the effects of early castration on slaughter and carcass characteristics of Norduz goat male kids.

MATERIALS AND METHODS

The study was conducted at the Yuzuncu Yil University Agricultural Faculty Research Farm in Van, Turkey with 25 local Norduz male kids. Kids were randomly separated into two groupsand the kids in one group (n = 13) were castrated at 1 week of age using

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elastrator rings while the other group (n = 12) was left intact. Feeding and management practices were applied equally to all kids. All animals were weaned at 3 months and then subjected to an 85 days fattening period in semi-open pens. Each kid was offered a diet of concentrate (16.6% crude protein and 10.6 MJ kg^{-1} DM ME) *ad-libitum* and 200 g sainfoin twice daily.

At the end of the fattening period, eight kids from each group were slaughtered to determine carcass characteristics. Hot carcass, skin, head, four feet, omental fat, heart, lungs and spleen weights were recorded immediately after dressing.

Carcasses were then refrigerated 4°C for 24 h and cold carcass weights were recorded. Carcasses were then separated into joints according to the standard method for goat carcass evaluation in Mediterranean Countries (Colomer-Rocher *et al*., 1987) and each joint was weighed separately. Chop joints (the 6th-12th ribs) were dissected into muscle, bone and fat for weighing, with subcutaneous and intermuscular fat depots recorded separately.

Data was analyzed using one-way analysis of variance (Minitab 13.0) according to the following model:

$$Y_{ij} = \mu + g_i + e_{ij}$$

Where:

Y_{ij} = The an individual observation
μ = The overall mean
g_i = The group effect (μ = intact male/castrate)
e_{ij} = The residual error normally distributed with a mean 0 and variance σ^2_e (Minitab, 2000)

RESULTS AND DISCUSSION

Kids were slaughtered after an 85 day fattening period to determine carcass characteristics and slaughtering traits. Slaughter and hot carcass weights are shown in Table 1.

Statistically significant differences were found in the slaughter ($p<0.01$) and four feet weights ($p<0.05$) and the hot carcass, head and skin weights ($p<0.01$) of intact males and castrates. However, no significant differences were found in dressing percentages, omental and mesenteric fat, heart, lung or spleen weights. Hot dressing percentages for the intact group and castrated group were 38.72±0.602 and 38.74±0.325%, respectively. Dressing percentages of different breeds of goat kids have been reported to be around 46-48% (Nitter, 1975; Hogg *et al*., 1992; Koyuncu *et al*., 2007), although lower dressing percentages have been reported for 3-5 months old Sudan Desert male kids fattened on pasture and Native Hair goat male kids (38.7 and 39.40%, respectively) (El-Hag *et al*., 2007).

Table 1: Slaughter characteristics of castrated and intact Norduz goat kids (n = 8)

Traits	Intact males	Castrates	p-value
Slaughter weight (kg)	30.41±1.061	24.84±0.465	**
Hot carcass weight (kg)	11.80±0.535	9.63±0.231	**
Hot dressing percentage(%)	38.72±0.602	38.74±0.325	NS
Head weight (kg)	1.52±0.046	1.32±0.027	**
Four feet weight (kg)	0.67±0.026	0.59±0.014	*
Skin weight (kg)	2.44±0.105	1.86±0.055	**
Omental and mesenteric fat w. (g)	278.50±35.00	296.13±28.00	NS
Heart, lungs, liver weights (kg)	1.12±0.045	1.03±0.046	NS
Spleen weight (g)	45.00±3.000	49.63±4.035	NS

*: $p<0.05$, **: $p<0.01$, NS: Not Significant; Values are expressed as $\bar{X} \pm S_{\bar{X}}$

Table 2: Cold carcass characteristics and left-side joint weights (n = 8)

Traits	Intact males	Castrates	p-value
Cold carcass weight (kg)	11.53±0.544	9.40±0.230	**
Cold dressing percentage(%)	37.81±0.662	37.82±0.308	NS
Testicle weight (couple) (g)	182.74±61.00	-	-
Kidney weight (couple) (g)	92.23 ± 4.00	90.69±5.260	NS
Kidney-knob and channel fat (g)	269.14±33.00	244.64±13.00	NS
Left-half carcass weight (kg)	5.55±0.244	4.73±0.106	**
Carcass joints weights in left-half carcass (kg)			
Shoulder	1.26±0.057	1.02±0.024	**
Hind leg	1.74±0.069	1.47±0.040	**
Neck	0.43±0.022	0.33±0.013	**
Flank	0.74±0.040	0.61±0.031	*
Back-loin	1.36±0.060	1.17±0.030	**

$p<0.05$, **: $p<0.01$, NS: Not Significant; Values are expressed as $\bar{X} \pm S_{\bar{X}}$

In the present study, no significant differences were found in the mean omental and mesenteric fat depots between the two groups. Omental and mesenteric fat measurements in this study were lower than those of some previous studies (Bayraktaroglu *et al*., 1988; Hogg *et al*., 1992; Kor *et al*., 2004) but higher than those of others (Kebede *et al*., 2008). Omental and mesenteric fat are some of the most important slaughter parameters. Whereas, muscle and bone development occurs at a slow pace in fattening goat kids, visceral fat depots (omental, mesenteric, perineal and pericardic fat) accumulate more quickly (Anonymous, 1988). Cold carcass (4°C at 24 h) characteristics are shown in Table 2.

Kidney knob and channel fat are two important characteristics of goat carcasses. This study found kidney knob and channel fat of intact male kids to be higher than those of castratesbut the difference between the two were not significant. Kidney and channel fat amounts in this study were similar to those found in some earlier studies (Aydin and Arik, 1999) but higher than those of other studies. Distributions of left-half carcass joints (%) are shown in Table 3.

With the exception of the neck joint ($p<0.05$), no significant differences were found in joint percentages between the two groups. Carcass joint percentages in this study were similar to those of some previous studies (Daskiran, 1992; Aydin and Arik, 1999; Kor *et al*., 2004; Koyuncu *et al*., 2007) but lower than those of others (Kor and Ertugrul, 2000).

Table 3: Distribution of carcass joints (%) (n = 8)

Traits	Intact males	Castrates	p-value
In left-half carcass			
Shoulder	22.69±0.435	21.64±0.269	NS
Hind leg	31.40±0.287	31.19±0.276	NS
Neck	7.78±0.226	7.00±0.207	*
Flank	13.34±0.259	12.87±0.485	NS
Back-loin	24.56±0.241	24.88±0.503	NS
In cold carcass			
Testicle (couple)	1.58±0.621	-	-
Kidney (couple)	0.80±0.021	0.96±0.047	**
Kidney-knob and channel fat	2.31±0.206	2.60±0.113	NS

*: p<0.05, **: p<0.01, NS: Not Significant; Values are expressed as $\bar{X} \pm S_{\bar{X}}$

Table 4: Tissue distribution (%) of chop region (Rib 6-12) (n = 8)

Traits	Intact males	Castrates	p-value
Muscle	43.15±0.822	41.48±0.579	NS
Bone	24.60±1.026	26.84±0.750	NS
Subcutaneous fat	7.66±0.711	10.21±0.615	*
Intermuscular fat	7.48±0.506	7.25±0.693	NS
Total fat	15.14±0.906	17.46±0.669	*
Losses[A]	11.61±1.390	10.31±0.438	NS

[A] Includes weight loss during dissection and minor tissue loss (nerves, tendons, lymph nodes, etc.) *: p<0.05, NS: Not Significant; Values are expressed as $\bar{X} \pm S_{\bar{X}}$

Whole and half-carcass tissue analysis requires a significant amount of time that reduces meat quality and results in economic loss. Crouse and Dikeman (1974) reported that tissue analysis of the chop region (ribs 6-12) can provide satisfactory results with less time and effort than whole or half-carcass tissue analysis. Therefore, this study conducted tissue analysis on the chop joint only (Table 4).

Significant differences were found in the percentages of subcutaneous fat and total fat (subcutaneous+intermuscular fat) between the two groups (p<0.05). No significant differences were found between the two groups in percentages of muscle, boneintermuscular fat or losses (i.e., weight loss during dissection and loss of nerves, tendons, lymph nodes and other minor tissue). Muscle percentages in this study were lower than those of some previous studies (Smith *et al*., 1982; Daskiran *et al*., 2006; Koyuncu *et al*., 2007) whereas bone percentages were higher than one previous study conducted with Angora and Spanish goats (Smith *et al*., 1982) but lower than another study conducted with Norduz goat male kids (Daskiran *et al*., 2006).

CONCLUSION

The findings of this study indicate that early castration does not have a significant impact on carcass characteristics of Norduz goat kids. In what may be considered an advantage for generally fatless and hard goat meat, this study found chop joints of castrated kids to have a higher percentage of fat than those of intact kids. Given the variety of conflicting reports regarding the effects of castration on goat meat yields, additional studies should continue to be conducted.

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